Claims

We claim:

1. A variable output power supply comprising:

an envelope detector for receiving an input signal and for generating a control signal representative of an envelope associated with the input signal; and

a controllable source for generating an output that dynamically varies in response to at least the control signal and functionally corresponds with the envelope of the input signal.

2. The variable output power supply of claim 1, wherein the controllable source comprises:

a multiple output power supply having a plurality of outputs, the multiple output power supply generating at least one of: (i) a plurality of substantially constant output voltages, and (ii) a plurality of substantially constant output currents corresponding to the plurality of outputs;

a multiplexing circuit responsive to at least one output selection signal for selecting at least one of the plurality of outputs; and

control circuitry having an input for receiving the control signal, the control circuitry generating the at least one output selection signal.

3. The variable output power supply of claim 1, further comprising:

an analog follower coupled with the envelope detector and with the variable output power supply, the analog follower generating a supply output signal having a magnitude that is substantially equal to the envelope of the input signal.

4. The variable output power supply of claim 3, further comprising:

at least one filter for substantially removing selected frequency components from the supply output signal.

5. The variable output power supply of claim 3, further comprising:

a delay circuit having a delay selected to enable the supply output signal to substantially track the envelope of the input signal.

6. The variable output power supply of claim 2, wherein the multiplexing circuit comprises:

a plurality of selectable switches, each of the switches coupled with a corresponding output of the multiple output power supply, a second terminal of each of the switches being coupled together to form an output of the controllable source, each of the plurality of switches having a control terminal for receiving the at least one output selection signal and selectively connecting a corresponding output of the multiple output power supply to the output of the controllable source in response thereto.

7. The variable output power supply of claim 2, wherein the control circuitry comprises:

a plurality of comparators each for receiving at least a portion of the control signal generated by the envelope detector and a respective reference source, the comparators generating the at least one output selection signal for selectively controlling a corresponding output associated with the multiple output power supply, the at least one output selection signal representative of a difference between the control signal and the reference source corresponding to a first comparator.

8. The variable output power supply of claim 7, wherein the reference source corresponding to at least a given one of the plurality of comparators is selected to be in a range substantially between an output generated by a corresponding output of the multiple output power supply and a next lowest output of the multiple output power supply.

9. The variable output power supply of claim 1, wherein the envelope detector comprises:

a digital signal processor (DSP) for generating the control signal, the control signal being a function of the envelope of the input signal received by the envelope detector.

10. The variable output power supply of claim 2, wherein the control circuitry comprises:

an analog-to-digital (A/D) converter for receiving the control signal and for generating a digital code representative of the envelope of the input signal; and

a digital signal processor (DSP) for generating the at least one output selection signal for control the multiplexing circuit.

11. The variable output power supply of claim 2, wherein a digital signal processor (DSP) implements at least one of a portion of the envelope detector and the controllable source.

12. An amplification system, comprising:

a variable output power supply, the variable output power supply having:

an envelope detector having an input for receiving an input signal presented thereto, the envelope detector generating a control signal that is representative of an envelope associated with the input signal; and

a controllable source operatively coupled to the envelope detector, the controllable source generating an output that dynamically varies in response to at least the control signal, whereby the output of the controllable source is a function of the envelope of the input signal; and

an amplifier having a predetermined gain associated therewith, the amplifier having at least one supply input operatively coupled to the variable output power supply for receiving the output from the variable output power supply, an input for receiving the input signal, and an output for generating an output signal.

13. The amplification system of claim 12, further comprising:

linearization circuitry operatively coupled to the amplifier, the linearization circuitry being configured to substantially remove a nonlinear component in the output signal generated by the amplifier.

14. The amplification system of claim 13, wherein the linearization circuitry comprises:

a feedforward path operatively coupled to the input signal, the feedforward path being configured to generate a feedforward signal that is substantially matched to a magnitude of the nonlinear component in the output signal generated by the amplifier; and

a summing junction having a first input for receiving the output signal, and a second input for receiving the feedforward signal, the summing junction being configured to subtract the feedforward signal from the output signal, whereby the feedforward signal substantially cancels the nonlinear component in the output signal.

15. The amplification system of claim 13, wherein the linearization circuitry comprises:

a predistorter having an input for receiving the input signal and an output operatively coupled to the input of the amplifier, the predistorter being configured to generate a predistortion signal having an original signal component and a nonlinear component, the nonlinear component in the predistortion signal substantially matching an inverse of the nonlinear component in the output signal generated by the amplifier, whereby when the predistortion signal is passed through the amplifier, the nonlinear component in the output signal is substantially removed.

16. In a linear amplification system having an amplifier, a method of providing a variable output power supply, the method comprising the steps of:

detecting an envelope of an input signal to be amplified;

generating a control signal, the control signal being a function of the envelope of the input signal;

providing a controllable source, the controllable source having a plurality of outputs and being configured to generate at least one of: (i) a plurality of output voltages, and (ii) a plurality of output currents corresponding to the outputs of the controllable source; and

selecting at least one of the outputs generated by the controllable source in response to the control signal to generate an output supply signal of the variable output power supply, whereby the output supply signal is a function of the envelope of the input signal.

17. The method of claim 16, further comprising the step of:

substantially removing at least a portion of a nonlinear component associated with an output signal generated by the amplifier.

18. The method of claim 17, wherein the step of removing at least a portion of a nonlinear component associated with the output signal comprises the step of:

configuring the amplification system in a feedforward arrangement, the feedforward arrangement having:

a feedforward path operatively coupled to the input signal, the feedforward path being configured to generate a feedforward signal that is substantially matched to a magnitude of the nonlinear component in the output signal generated by the amplifier; and

a summing junction having a first input for receiving the output signal, and a second input for receiving the feedforward signal, the summing junction being configured to subtract the feedforward signal from the output signal, whereby the feedforward signal substantially cancels the nonlinear component in the output signal.

19. The method of claim 17, wherein the step of removing at least a portion of a nonlinear component associated with the output signal comprises the step of:

predistorting the input signal to generate a predistortion signal, the predistortion signal having an original signal component and a nonlinear component, the nonlinear component in the predistortion signal substantially matching an inverse of the nonlinear component associated with the output signal generated by the amplifier, whereby when the predistortion signal is passed through the amplifier, the nonlinear component in the output signal is substantially removed.